**Partnership for**

**Science & Engineering Practices**

**Summer Institute 2013**

Institute for Systems Biology

June 24, 2013

Participant

Notebook



A Math and Science Partnership Award from Washington’s Office of Superintendent of Public Instruction

This is Her Future (Video)

Use the space below to capture questions and thinking about the video.

<http://www.myfuturemyscience.org/>

What does the video tell us and show us about the work at *The Institute for Systems Biology*?

What does the video suggest for our work as K-8 educators?

My Science Story

**Part One:** Take a minute to think about your own Science Story. Use the table below to jot down some ideas about your experiences as both a LEARNER and TEACHER of science.

|  |  |  |
| --- | --- | --- |
| **Learner** of Science | **Teacher** of Science | **Type of Experiences** |
|  |  | Powerful |
|  |  | “Not my Favorite” |

**Part Two:** Share your science story with an elbow partner. Listen to your partner’s science story.

**Part Three:** Did you notice any common elements in your stories? How do you think our past experiences as learners and teachers of science might affect our present day instruction?

Partnership for Science & Engineering Practices Overview (page 1 of 2)

How do the three policy initiatives below affect you? Consider your teaching, your school or district PD, conversations with your principal (formal and informal) and how you spend your professional time.

* WA State Science Standards
* Common Core State Standards, ELA and Math
* TPEP (Danielson Framework)

Given the expectations of policies for WA State Standards, CCSS, TPEP, and NGSS, *what supports do you need to effectively plan instruction for your students?*

Partnership for Science & Engineering Practices Overview (page 1 of 2)

What do you hope to receive from the Partnership?

What do you plan to contribute?

What interests you most about the Partnership?

What questions do you still have about the Partnership?

Doing Science (Part 1)

A group of teachers were learning about the *Next Generation Science Standards*. They started discussing how scientists and engineers do their work. Their ideas are in the table below.

* Check the idea that YOU most agree with
* Check the idea(s) that your STUDENTS might most agree with

|  |  |  |  |
| --- | --- | --- | --- |
| **Teacher**  **Name** | **Ideas** | **I Agree With** | **My Students Might Agree With** |
| Tom | I think scientists and engineers use **inquiry** to do their work. |  |  |
| Felitia | I think there is a set of steps called the **scientific method** that all scientists and engineers follow. |  |  |
| DeShawn | I think scientists and engineers use **controlled experiments** to do their work. |  |  |
| Maria | I think scientists and engineers use a **wide range of approaches (practices)** to explain the natural world and solve problems. |  |  |
| Sam | I think scientists and engineers just **try out different things** until something works. |  |  |

Explain why you agree with that teacher and why you disagree with the others. Compare your idea to what your students might think.

Doing Science (Part 2)

**A.** As you watch the **How Science Works** video, jot down evidence that either supports or refutes some of the ideas on p. 5

**B**. How might we help students to move beyond ideas about “The Scientific Method” or Controlled Experiments?

Getting to Know the Framework & NGSS

Use the space below to **capture thoughts** and **questions** as you learn about the 3 Dimensions of the Framework and the Next Generation Science Standards.

|  |  |
| --- | --- |
| **Notes** | **Questions** |
| **Practices of Science & Engineering** | |
|  |  |
| **Crosscutting Concepts** | |
|  |  |
| **Disciplinary Core Ideas** | |
|  |  |

The 3 Dimensions of the Framework

## 1 Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models

3. Planning and carrying out investigations

4. Analyzing and interpreting data

5. Using mathematics and computational thinking

6. Constructing explanations (for science) and designing solutions (for engineering)

7. Engaging in argument from evidence

8. Obtaining, evaluating, and communicating information

## 2 Crosscutting Concepts

1. Patterns

2. Cause and effect: Mechanism and explanation

3. Scale, proportion, and quantity

4. Systems and system models

5. Energy and matter: Flows, cycles, and conservation

6. Structure and function

7. Stability and change

## 3 Disciplinary Core Ideas

*Physical Sciences*

PS1: Matter and its interactions

PS2: Motion and stability: Forces and interactions

PS3: Energy

PS4: Waves and their applications in technologies for information transfer

*Life Sciences*

LS1: From molecules to organisms: Structures and processes

LS2: Ecosystems: Interactions, energy, and dynamics

LS3: Heredity: Inheritance and variation of traits

LS4: Biological evolution: Unity and diversity

*Earth and Space Sciences*

ESS1: Earth’s place in the universe

ESS2: Earth’s systems

ESS3: Earth and human activity

*Engineering, Technology, and Applications of Science*

ETS1: Engineering design

ETS2: Links among engineering, technology, science, and society

Reflecting on the Framework & NGSS

What important ideas did you collect about the **Next Generation Science Standards**?

What are you still wondering about the **Next Generation Science Standards**?

What might be some challenges your district will face in transitioning to the **Next Generation Science Standards**?

Digging into the Practices

During the next few hours you will go on a journey to become an expert on ONE of the 8 Practices of Science & Engineering.

Your table group will do the following:

Digging into the Practices

Examining text on the Scientific and Engineering Practices

Your table group has been assigned ONE of the EIGHT Practices.

Circle the practice you are learning about.

## Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)

2. Developing and using models

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5. Using mathematics and computational thinking

6. Constructing explanations (for science) and designing solutions (for engineering)

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8. Obtaining, evaluating, and communicating information

After skimming the TWO pieces of text:

1. What **new ideas** do you have about this practice?
2. What **questions** do you have about this practice? (You might want to ask your ISB scientist about these after lunch)

Lunch with a Scientist

During your informal lunch conversations with a scientist you may want to capture some information on the following. This is your time to get to know the work at ISB and the daily work of a real scientist.

1. What is the scope and purpose of research at ISB? (General overview; not specific to an individual’s role and research)
2. What is the day in the life of an ISB researcher? (e.g., when arrive at work; when leave; how much time spent in meetings; how much time spent writing; how much time spent at bench; etc.)
3. What was your pathway to your current position at ISB? (What career advice do you have for students?)

Talking with a Scientist (page 1 of 2)

Collect evidence from your ISB scientist that address the following questions

1. What is an example of the practice from your work?
2. How is the practice instrumental for advancing science / engineering?
3. Compare how the practice is used in science vs engineering
4. How does the practice tie (connect) to the other practices?

Talking with a Scientist (page 2 of 2)

1. How does this practice compare to the traditional scientific method?
2. How is this practice part of current instruction? (ISB staff as listeners)
3. How might this practice be made more authentic during instruction? (ISB staff as advisor)
4. What are other real world examples of the practice? (ISB staff as advisor)

Gallery Walk of Practices

After visiting the 8 posters on Science & Engineering Practices, how have your ideas about “doing science” and engineering changed (or not) since this morning?

What **supports and opportunities** might your students need in order to start engaging in these Science & Engineering Practices?

Practices in the NGSS

Below are two Performance Expectations (PEs) from the Next Generation Science Standards.

* Underline wording that connects to the Science & Engineering Practices

**Grade 4**

**4-PS3-1**

**Use evidence to construct an explanation relating the speed of an object to the energy of that object.**[*Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.*

**Grade 6-8**

**MS-PS3-5**

**Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.**[Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [*Assessment Boundary: Assessment does not include calculations of energy.*]

Notes